IAEA

International Conference on Human Ressource Development for Introducing and Expanding Nuclear Power Programmes

Nuclear skills Renewal and Development

EDF views and actions

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Senior nuclear advisor to the CEO

EDF

For EDF Group:
3 strategic priorities for the development of nuclear

With 58 NPPs in operation in France , 82 within in the EDF Group, EDF has 3 main strategic priorities

- **Continuing safe and efficient nuclear fleet Operations**:
  ongoing improvement in safety and extended operation for NPPs, learning from each year of experience.

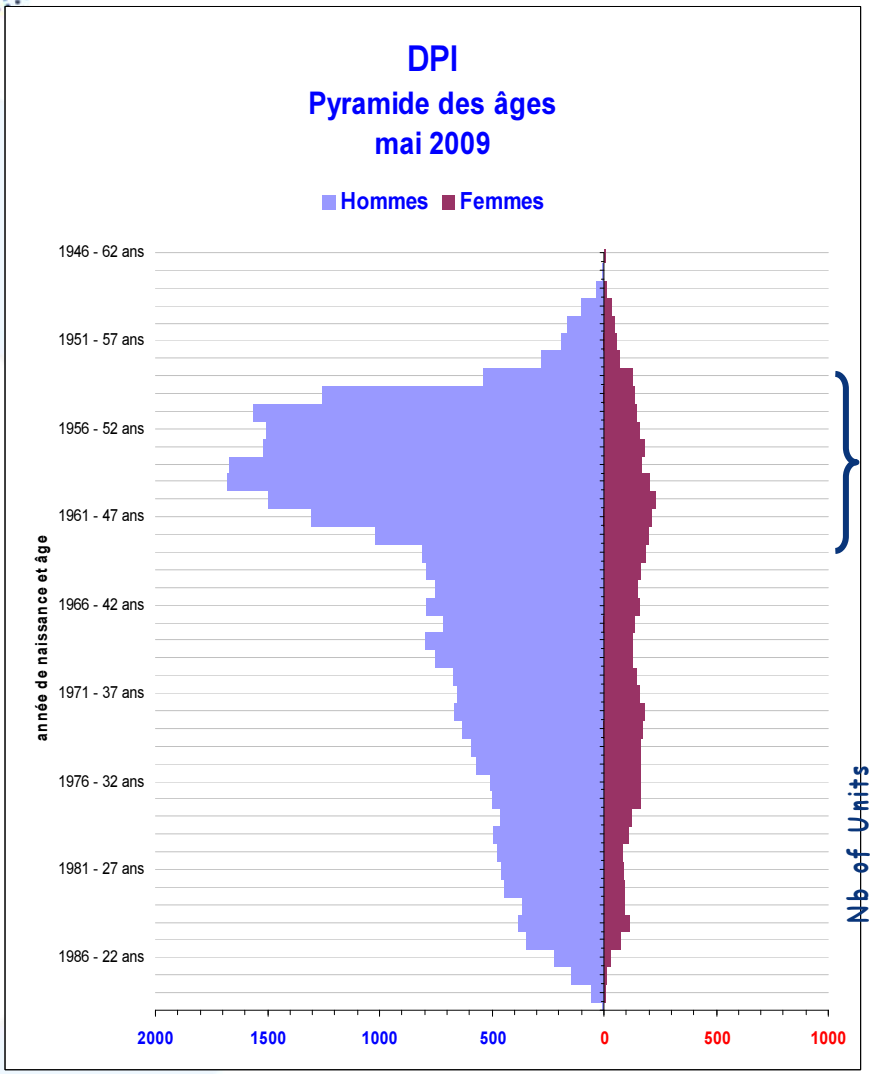
- **Participate in the global development of nuclear power:**
  - **In France,** construction of EPR at Flamanville 3, and then Penly 3,
  - **Internationally,** participate in the global nuclear revival with priority for countries where we have historical links

- **Prepare for the longer term**
  by supporting international research programmes on Generation IV reactors.

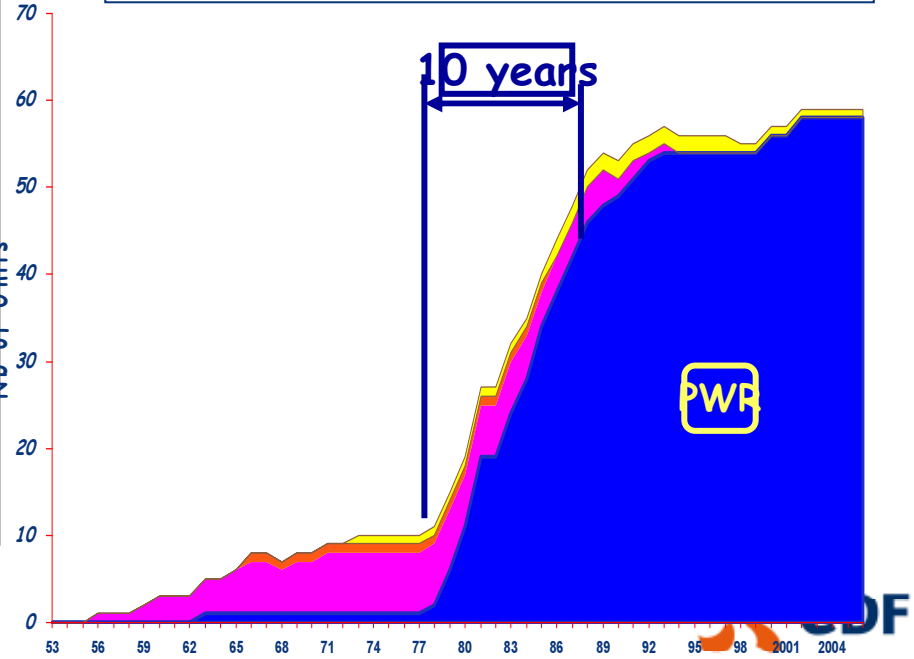
Renewing / Upgrading skills, a necessity and an opportunity for EDF

- ~~ 35,000 people currently involved in nuclear within the EDF Group
- ~~ 40% of Managers and Engineers expected to retire
  over a period of about 10 years ~~ 2008-2017,
  in EDF Generation, Engineering, R&D, …
- Development of new projects out of France :
  - ➔ ~~ 800/1000 additional engineers in the coming years
- Renewing the Group's skills and expertise by recruiting
  - ➔ more than 5,000 engineers for nuclear over the next 10 years,
  - ➔ in France and UK, and also in/for other countries

EDF Generation population pyramid



Construction & Commissioning of the French PWR Fleet



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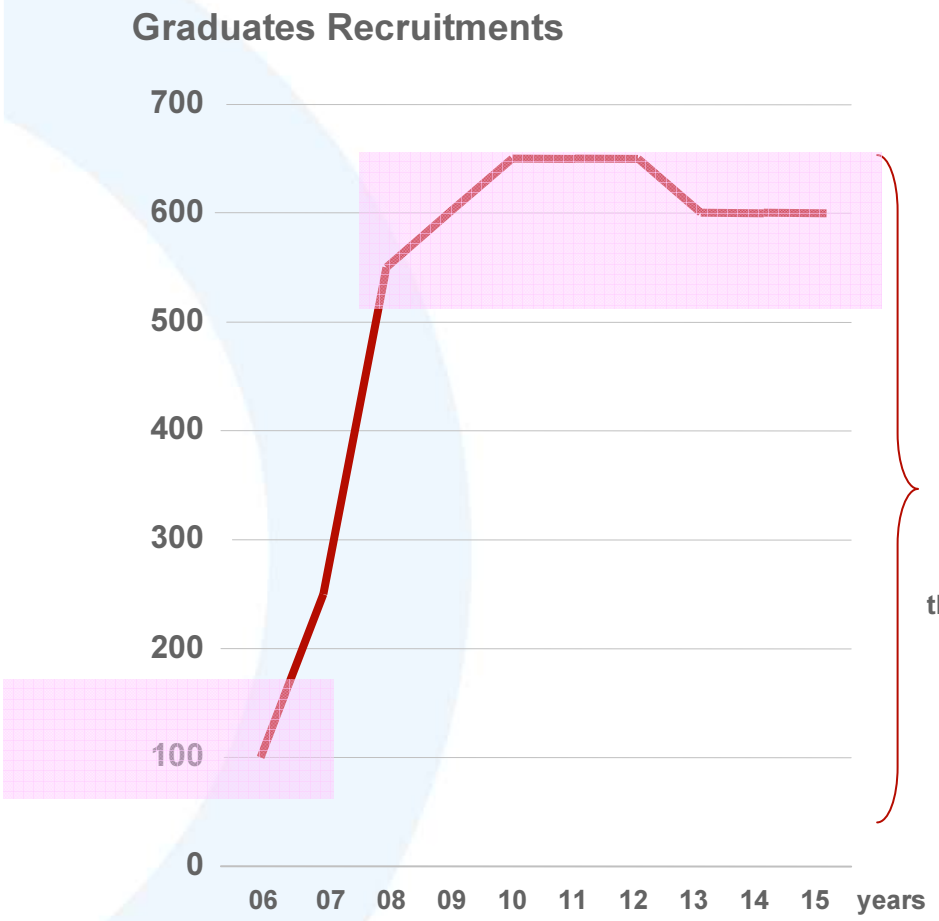
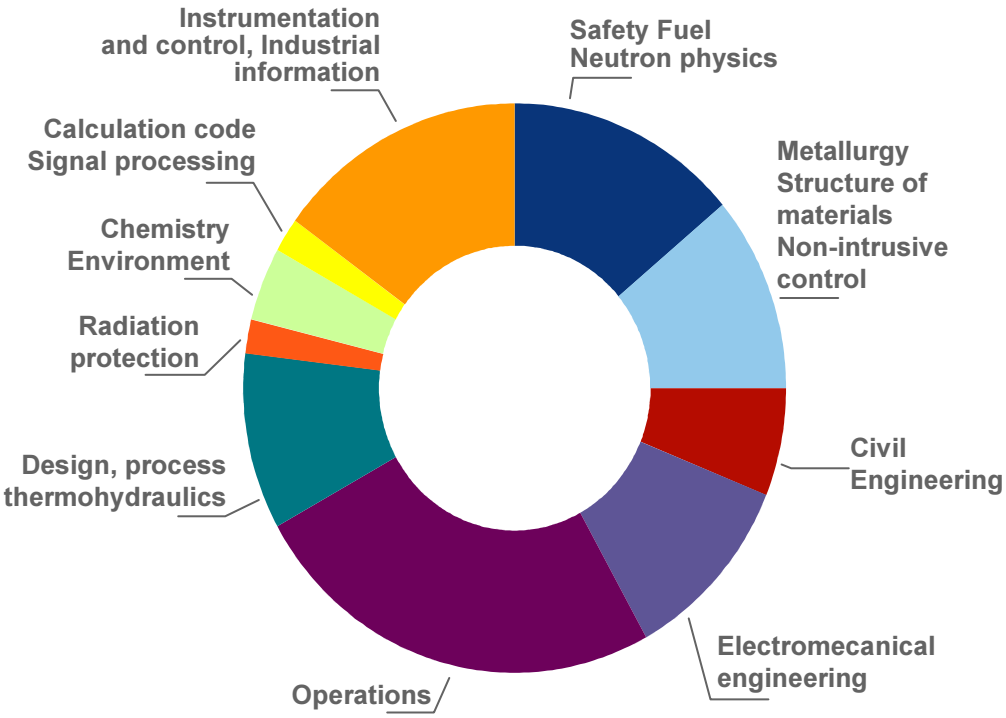
Since 2008, a 4-5 fold increase in recruitments of graduates in EDF nuclear sector, in a number of different areas



First position for young graduates



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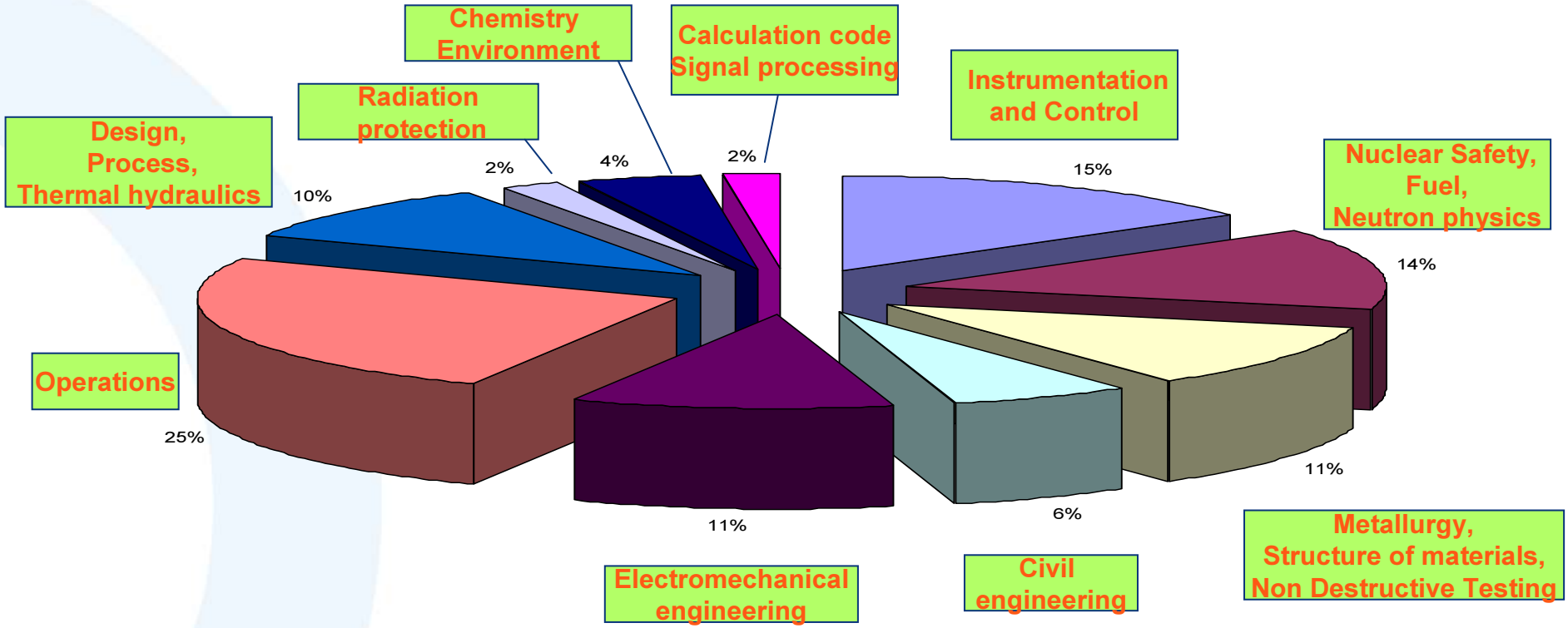
Recruitment of Engineers by EDF in the nuclear sector



Need for skills for Design, Construction, Operations, Dismantling,… of NPPs goes beyond pure nuclear education and training

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Getting skills: different ways of Education and/or Training (1/2)

- Before recruitment: Initial Academic Education
  - Master's degree, Engineering schools,…
  - …
- After recruitment:
  - initial training and integration
  - continuous vocational training
  - specialized training
  - specific operator's training (initial qualification, periodic training, …)
  - on the job training
  - …
- Possible different needs/trainings for other actors (# Owner/Operator)
  - Designers and suppliers
  - Authorities and TSOs
  - Research organizations
  - …

Getting skills: different ways of Education and/or Training (2/2)

- EDF developped a comprehensive organization and program
  - Progressively, over time, along with the development of NPPs
  - Mostly based on internal means
- A large organization
  - ~~ 2,5 million hours of training per year
  - ~~ 650 different courses (200 Process; 450 Operation/Maintenance)
  - ~~ 740 persons, including ~~ 530 teachers
  - based mainly on 19 training centers, with full scope simulators, located at each NPP site
- A significant commitment
  - ~~10% of total labor cost for nuclear sector

EDF's in house vocational training

On the job training

- ✓ A very important part of the skills build-up
- ✓ Nuclear skills, is also a "collective skill" not just a sum of individual skills

Vocational training organisation

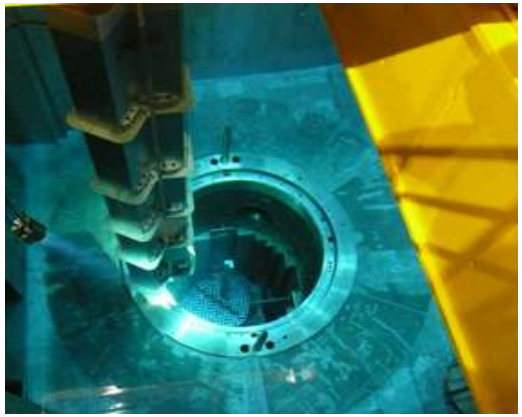
- ✓ An Academy for Operations, (1st year).
- ✓ An Academy for Engineering, (1st year).
  (adapted according to initial academic education)
- ✓ Nuclear education and training courses for people in charge of Operations (operators, safety engineers,…).
  (both initial education and training, as well as periodic training)
- ✓ Specific and specialized courses in a variety of domains,
  to train /accompany personnel during their professional career.

Many diverse pedagogical tools

▲ CP0 Full scope Simulator

▲ Diesels training facilities

▲
◀training equipmen
for hydro sector



▲CETIC - Mock-up
for fuel loading/unloading

▼ Valves training

In a new context, EDF's commitment and initiative in Strengthening Education & Training

A 2 fold effort:

- **Adaptation of the internal EDF education & training process**
  - **Mainly to cope with increased numbers of young personnel**

- **Dialogue and partnerships** established **with the best universities and "grandes écoles"** in France and abroad

  1. **Strengthening and structuring the energy curriculum in engineering schools**
  2. **Establishing an International Master of Science "Nuclear Energy" to attract French and foreign students** (2-year teaching programme in English)
  3. **Establishing post-Master professional certifications with the best Universities and engineering schools** (e.g.: nuclear safety, radiation protection, etc.)
  4. **Funding Chairs, to help link Research and Education**

With a vehicle to support financing

EDF | Fondation européenne pour les énergies de demain
INSTITUT DE FRANCE

EDF sponsoring new educational initiatives for the benefit of the whole nuclear industry

Master of Science in Nuclear Energy

ParisTech
INSTITUT DES SCIENCES ET TECHNOLOGIES
PARIS INSTITUTE OF TECHNOLOGY

CENTRALE PARIS

UNIVERSITÉ PARIS-SUD 11

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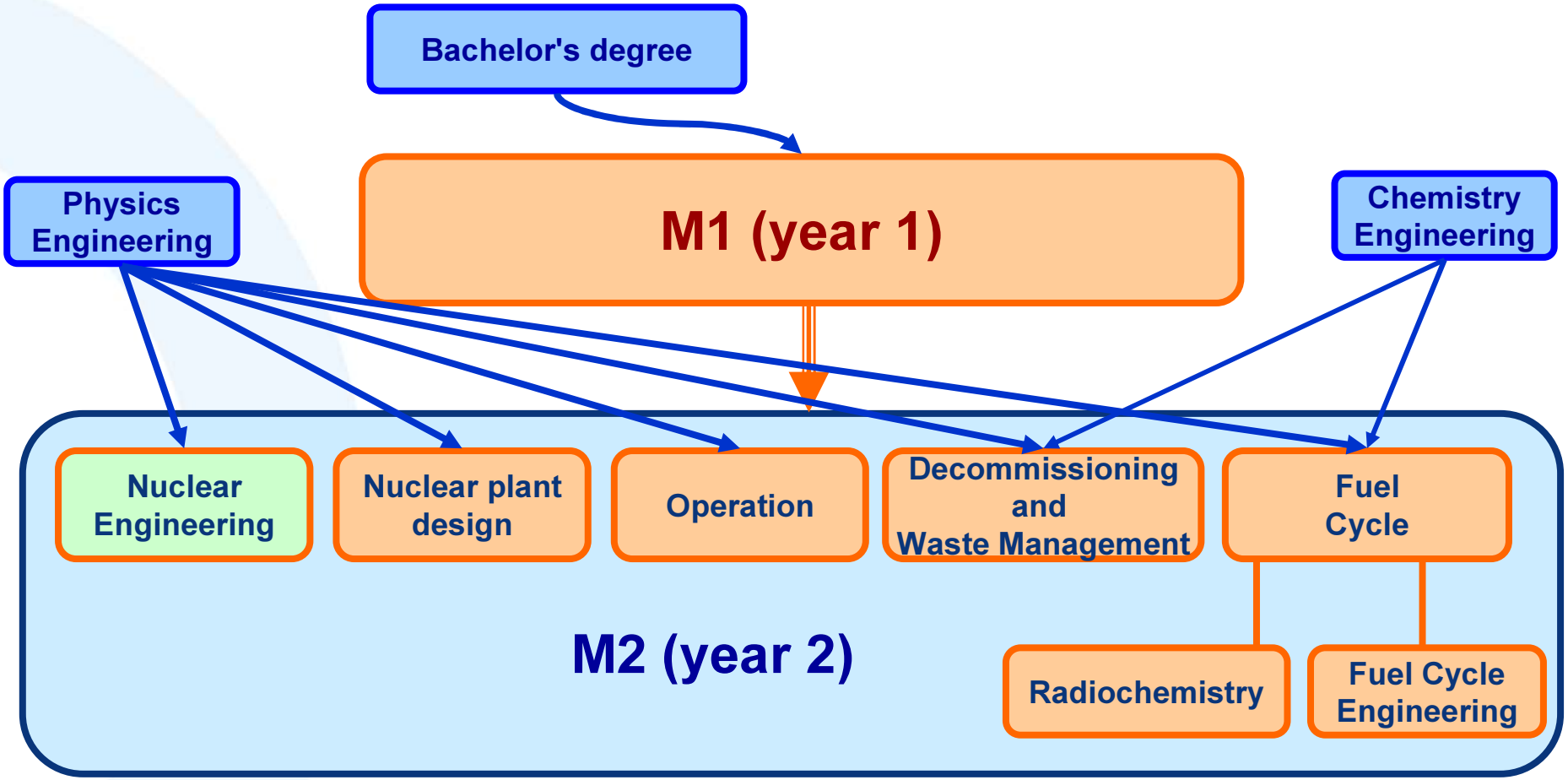
Master of Science in Nuclear Energy
Paris - France



www.master-nuclear-energy.fr

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Master of Science in Nuclear Energy
Paris - France

M1 (1st year)

- Core courses
  - Nuclear physics
  - Fluid dynamics and heat transfer
  - Material science
  - Overview of energy technologies
  - Instrumentation & Control
  - Electrical engineering
  - Chemical engineering
  - Economics, management
- Language and Culture courses
- Student project and internship (~~ 10 weeks)

M2 (2nd year)

- Core courses :
  - Nuclear safety and radioprotection
  - Project and risk management
  - Computer design and simulation
  - Environmental issues
- Choice between 5 majors :
  - Nuclear engineering
  - Nuclear plant design
  - Nuclear operations
  - Nuclear fuel cycle
  - Decommissioning and waste management
- Training sessions on EDF simulators
- Master's thesis and internship
  - within an industry company
  - within a research lab

All courses in English

EDF supporting new educational initiatives for the benefit of the whole nuclear industry

Other initiatives are taken in the nuclear education area:

- **Creation of a Chinese- French Institute for Nuclear Energy**
  - Cooperation of academic organizations
    Sun Yat Sen University ⇔French consortium (Universities / "Grandes Ecoles")
  - From High school to a Master's degree

- **EDF supports the implementation**
  - Pedagogical contribution to ensure consistency of programs with industrial skills needs
  - Financial contribution to support the institute

EDF Fondation européenne pour les énergies de demain
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To conclude

- A real need to continue and strengthen education and training, to face the great future of nuclear energy
- EDF is committed to contribute to this effort, and launched a number of initiatives,
  - Internally,
  - Towards the academic education system
  - Including human and financial support
- the international Master in Nuclear Energy
  - a significant contributor to an appropriate initial education,
  - in line with the needs of Operators and Industry
  - open to students from France and other countries
  - Sponsored by EDF and benefits from the French context and facilities
  - Is a main component of the International Institute for Nuclear Energy

Thank you for your attention

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